

TO: TANDEM Programmers

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RE: Cross Assembling

On Monday, February 2 a new version of CRASS will be installed on the TANDEM. Its use will be different. This memo describes the use of CRASS, how it now differs from the Microtec instruction manual, and contains information about object files and downloading. (The old version of CRASS will become OCRASS and will be around for a while.)

The new CRASS no longer uses ASSIGN KIM to specify the object file (assigning KIM is not an error; it will be ignored). Instead, the object file name is placed at the end of the run line. Examples:

```
CRASS /IN source, OUT $LP/ object
    assembles from source to object, listing to printer
CRASS /IN source/ object
    listing comes to terminal
CRASS /IN source, OUT $LP.#HOLD/
    listing to spooler but no print, and no object file;
    don't forget to delete the listing from the spooler later
CRASS /IN source, OUT $LP.#HOLD, NOWAIT/ object
    assembly continues independent of terminal;
    hitting BREAK some time after assembly starts
    has same effect as NOWAIT
```

Note that you do not specify the priority. This is automatically set by the system at 110.

LIST E now works. LIST A (absolute assembly) is the current default. Errors are marked with an accent grave (`) to allow you to find them with PERUSE to save paper and printing time. This is highly recommended.

New features will be coming soon without announcement: errors in assembling will come out in English, rather than the old FORMATTER (FORTRAN) errors. Protection will be added to prevent overwriting your source if you accidentally specify the same file for your object.

There is one known bug in CRASS: LABEL *==+n reserves the proper number of bytes, but the label may not be set at the beginning of the region. Use .RES n instead of *==+n.

There are three possible forms of object file, each with certain advantages and disadvantages. Here's all three--you can make your own choices. The first two require FUP COPY to list the object to LNBUG. Before typing the FUP COPY, you need to type ctrl-P to let LNBUG know it should load; after the copy, type ctrl-T to turn the load mode off. Ignore the errors the ctrl-P and ctrl-T produce. You can put the ctrl characters and FUP COPY command in an OBEY file--see me for details.

The first is the type we've been using so far. This is the default, the so-called Type U (unformatted) file. CRASS will create a type U object file if the file is not explicitly created before you run CRASS. It will be given the default space, which some people have

found is too little for their programs. You may pre-create a type U file with larger space by saying to COMINT:

```
CREATE yourfile,ext
```

where ext is the extent size (2 or 4 or 8 recommended). CRASS will write 132-byte fixed-length records to a type U file. When you use FUP to download this, you may want to specify RECOU 44 to prevent downloading the many trailing blanks in each record (FUP COPY object, RECOU 44). Note that RECOU 44 is specific to object files produced by CRASS--other assemblers produce object lines of different lengths.

Another possibility is the Type E (entry-sequenced) file. You use FUP to pre-create the type E file (FUP CREATE yourfile,TYPE E). The length of each record is kept by the system with type E files, so there is no wasted space. For this reason the default space will most likely always be enough. You never need to specify RECOU when telling FUP to download a type E file. You only need to create your type E object file once, but you must clear out the old data each time you re-assemble into it (FUP PURGEDATA yourfile); otherwise, the new object will be appended to the old.

You may convert your type U or type E file to EDIT format (code 101). This is most useful for long-term saving of a finished object file. To do this:

```
EDIT object PUT $SYSTEM; PUT newobjname; EXIT
```

You may then rename and edit your new object file--adding comments specifying version, for example. EDIT may be used instead of FUP to download an EDIT-format object file. Type

```
EDIT newobject; O O.DLOAD
```

This method of downloading avoids the typing ctrl-P and ctrl-T which you need when downloading using FUP. The obey file O.DLOAD transmits these characters to LNBUG for you. You may also use the FUP--downloading technique with EDIT object files--RECOU isn't needed.